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मानक

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“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

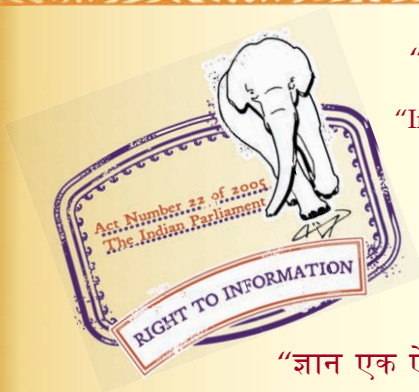
“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 7155-2 (1986): Code of recommended practice for conveyor safety, Part 2: General safety requirements [MED 6: Continuous Bulk Conveying, Elevating, Hoisting Aerial Ropeways and Related Equipment]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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*Indian Standard***CODE OF RECOMMENDED PRACTICE FOR
CONVEYOR SAFETY****PART 2 GENERAL SAFETY REQUIREMENTS***(First Revision)*

1. Scope — Sets out general safety requirements relating to continuous mechanical handling equipment, including its construction, installation, utilization and maintenance, to ensure its uses to the optimum advantage, and to prevent, as far as possible, any accidents or mishaps that could arise from misuse.

1.1 These safety requirements shall be in addition to the requirements/information given in IS : 7155 (Part 1)-1986 'Code of recommended practice for conveyor safety: Part 1 General information'.

2. Application — These safety requirements apply in the normal working conditions defined in 2.3 of IS : 7155 (Part 1)-1986.

2.1 These safety requirements apply to continuous mechanical handling equipment proper, excluding the structures (building frameworks, planks, etc) to which such equipment is affixed or on which it is placed and for which the user is responsible, except when such structures have been designed, supplied and erected along with the conveying device.

2.2 The main object of these requirements is the safety of the personnel defined in 2.4 of IS : 7155 (Part 1)-1986.

2.3 Skilled personnel, such as fitters, maintenance and repair personnel, who only work from time to time at the request of the person responsible for the plant, shall observe special requirements, particularly those set out in 3.3.17 to 3.3.21.

2.4 Persons whose duties do not demand their presence on the plant or in the vicinity of the equipment under consideration shall observe orders forbidding access to certain areas.

3. General Requirements — The construction and operation of all continuous mechanical handling equipment for loose bulk materials and unit loads shall meet the statutory, specific and other requirements relating to safety in general; the principles laid down in 1 and the following general requirements.

3.1 In the Construction Stage (Design and Manufacture)

3.1.1 Design and construction of platform, walkways, stairways and ladders — The design of platforms, walkways, stairways and ladders shall be such that adequate clearance is provided for normal operation; servicing and maintenance, giving sufficient room for freedom of movement and access for carrying out such duties.

3.1.2 The stability and strength of the equipment (static or mobile) shall be ensured under all normal working conditions, including climatic conditions as agreed to by the interested parties.

3.1.3 The whole conveyor path and especially the loading, unloading and transfer points, shall be designed so as to avoid as much as possible all spillage of products or conveyed material.

3.1.4 The slopes and the characteristics of the conveying element shall be designed so as to avoid slipping and/or unintentional dropping of the conveyed products under normal working conditions.

3.1.4.1 The support element of the material or load (belt, buckets, swing trays, etc) shall have sufficient size to be suitable for the transport of the specified product or load.

3.1.5 To prevent over-running or running backwards of the conveying device, all inclined or vertical appliances shall include a safety device which operates whenever the motive power is cut off or fails and where the load conveyed possesses kinetic or potential energy. Nevertheless, a safety device for this purpose is not compulsory for those special cases as agreed to between the purchaser and the manufacturer.

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3.1.6 Certain fixed or mobile appliances may include an articulated or mobile part in a vertical plane, actuated by a motor or manually; in which case, there shall be a compulsory safety device for immobilizing such an articulated part in the event of voluntary or accidental stoppage of the motive power even if the latter is manual.

3.1.6.1 The lowering and raising system shall be fitted with a safety device to prevent accidental lowering or lifting of the boom, and to prevent kickback of any manually operated crank.

3.1.6.2 The device for lowering and raising the movable part shall be so located that there is no necessity for the operator to be under the conveyor for operating the device.

3.1.6.3 The movement shall be limited at the extreme positions, by stops capable of supporting the stress due to the load.

3.1.7 In cases of manual loading and/or unloading, the characteristics of the unit (height, width, speed, etc) shall be suitable for the working stations.

3.1.7.1 Mechanical devices shall be installed for:

- a) the loading and unloading of unit loads exceeding 50 kg,
- b) the loading of unit loads when the vertical speed exceeds 0.5 m/s, and
- c) the unloading of unit loads when the vertical speed exceeds 0.25 m/s.

3.1.8 The in-running nips and pinch points of the conveying device (belts, chains, belt pulleys, etc) and the movable parts (chain sprockets, spur gears, couplings, etc) shall be protected.

3.1.9 When shearing and squeezing points or zones exist on the path of the conveying element (for example at a change of direction, or the close approach to fixed parts, etc), guards shall be provided.

3.1.10 All movable parts giving access through mechanical handling equipment shall be designed so that they cannot be opened whilst the apparatus is working and so that the appliance cannot be used or started while they are 'open'.

3.1.11 The loading and unloading openings of the enclosed units (in casing or in housing) shall be made in such a way that they prevent access to the moving components; otherwise suitable protection shall be provided.

3.1.12 Openings in enclosed appliances, which give access to moving parts, shall be guarded by covers which require a hand tool for removal or are locked or are interlocked with the drive to the equipment. Cover which it is necessary to open while the appliance is in operation shall expose a suitable fixed grating, which shall prevent access.

3.1.13 Access to inspection holes shall be easy.

3.1.14 All the lubrication points used frequently shall be accessible without it being necessary to remove the guards.

3.1.15 It is recommended that equipment be so designed that cleaning is facilitated.

3.1.16 Equipment mounted on a moving frame, or any other additional equipment, such as the loading chute, feeders, etc, whether they are self-propelled or hand-operated, shall be provided with a device enabling them to be immobilized.

3.1.16.1 Safety devices shall be provided to limit the travel of such equipment.

3.1.17 Wheels or rollers of travelling conveyors and of additional travelling equipment shall be guarded at points accessible to personnel under normal working conditions.

3.1.18 Whenever an operator remains on the travelling equipment, a platform shall be provided and be so designed as to prevent any accidental contact with mobile components or any part of the fixed installation.

3.1.19 When mobile appliances or equipment travel alongside an unprotected gangway, warning devices shall be provided.

3.1.20 Sharp edges and corners shall be avoided.

3.1.21 The projecting parts of moving equipment shall be as small as possible.

3.1.22 Overhead gentry portion of road and rail crossings, walkways, galleries, work places under the overhead conveyors used by the personnel, shall be protected by means of suitable covering such as plates/steel sheet covers to prevent falling of the material/objects over such areas/personnel.

3.2 During the Installation Stage (Layout, Erection and Entry into Service)

3.2.1 All powered appliances or complete installations shall carry the following indications permanently and legibly marked in a clearly visible place:

- a) Name of the manufacturer or the supplier, and
- b) Year of manufacture and serial number.

3.2.2 Access to Conveyors — Permanent platforms shall be provided from which all parts of the plant which need to be reached for the purpose of operation, regular servicing and maintenance are regularly and safely accessible. A clear access platform or floor space of at least 0.50 m width shall be provided for the maintenance of every driving mechanism. All service platforms of appliances and cabins on which operating personnel may be required to be stationed should remain horizontal.

3.2.3 All gangways, staircases, steps or platforms provided shall offer a minimum passageway of 0.50 m. They shall be protected on the open side by guard-rails composed of a hand-rail normally 1 m above the walkway, a knee-rail and a toe-guard, or by an equivalent plain sheeting. In the case of gangways inclined more than 5°, a suitable non-slip surface to avoid slippage/skidding shall be provided with uninterrupted vertical sheeting on the side remote from the moving appliance. A hand-rail shall be provided on this side. To avoid the risk of trapping by a moving device, the height of the hand-rail can be modified to not less than 0.80 m above the walkway so as to ensure a minimum clearance of 0.50 m between the appliance and the hand-rail.

3.2.3.1 Access between movable parts of static appliances, or the load that they carry and fixed obstacles, shall be prevented by guards when the free space is less than 0.50 m.

3.2.3.2 Access between the preset path of mobile appliances and fixed obstacles shall be prevented by guards when the free space is less than 0.50 m.

3.2.4 There shall be fixed access to platforms, floors, or similar constructions located more than 1.50 m above ground level.

3.2.4.1 Platforms at different levels shall be adequately and conveniently connected by stairways or where stairways are not practicable, by fixed ladders. It is recommended that ladders be avoided as a means of access and access shall preferably be by a sloping ramp with slats, or by a staircase. The angle of staircases in relation to the horizontal shall not exceed 60°.

3.2.4.2 If a ladder has to be used, the width between the uprights shall be 0.35 m minimum; on the access side, the free space between the ladder and any continuous obstacle shall be 0.60 m minimum; this free space may be reduced to 0.40 m near a localized obstacle of small width; on the opposite side, the free space between the ladder and any obstacle shall be 0.20 m minimum. When the ladder is put vertically or at an angle equal to or greater than 70° and its vertical height is equal to or greater than 5 m, a protection (crinoline, guard or other device) shall be provided commencing 2 m from the starting level.

3.2.4.3 Suitable landings or resting places, where practicable, shall be provided if agreed to between the purchaser and the manufacturer.

3.2.4.4 Access to plant for purposes of operation shall be from floors and platforms and not from stairways or fixed ladders. Portable ladders shall not be used as places from which operation or regular servicing may be carried out. However, their use may be permitted for occasional maintenance in situations not exceeding 3.5 m in height. Where the height exceeds 3.5 m up to a maximum of 6 m, other suitable means such as an approved mobile work platform or a tower ladder may be used provided adequate access is available for their use and to enable placement with ease.

3.2.4.5 Where walkways are provided on both sides of a conveyor and where convenient access to either side of the conveyor may be required by employees, who regularly work in the area, crossovers

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shall be provided at appropriate intervals and at the head and tail ends of the conveyors where no other crossing is available. Safe means of access shall be provided at crossovers.

3.2.5 All flooring of platforms or gangways and treads of staircases and stops shall be selected to suit individual installations and working conditions, and shall have a non-slip surface.

3.2.6 It is recommended that sharp edges and corners be avoided in the areas normally accessible to personnel between the floor and a height of 2 m.

3.2.6.1 This recommendation need not be followed if such edges and corners are protected.

3.2.7 In case where the clearance beneath the appliances, at a passageway, is less than 1.90 m, it is recommended that access be by means of a gangway running over the appliance.

3.2.8 All authorized passageways, protected if necessary, shall be indicated in a clear manner.

3.2.9 In cases where appliances which penetrate into a pit or extend through floors leave openings, the latter shall be protected by guard-rails and toe-guards.

3.2.10 Where appliances pass above work stations or passageways, suitable protection shall be provided against accidental dropping of conveyed materials.

3.2.11 *Conveyer control* — Except where the conveyor is under the control of an operator, electrical and/or mechanical devices shall be provided on all conveyor systems to automatically stop a conveyor or the load when the conveyor, bin, or hopper to which it feeds, has been stopped or has been blocked with load so that it cannot receive additional load or material. This requirement may also be applicable to chutes for special applications and if agreed to by the manufacturer and the user at the time of enquiry or order.

3.2.11.1 Sequence interlocks shall be provided so that no mechanical handling appliance can supply another appliance which is inoperative or has reached its full capacity.

3.2.12 All starting and stopping devices shall be clearly indicated and easily accessible and shall be in accordance with the requirements of IS : 4237-1982 'General requirements for switchgear and controlgear for voltage not exceeding 1 000 V'.

3.2.12.1 Instantaneously operating manual stop-lock devices shall be provided either continuously or at selected points along the installation. Resetting of these devices shall be carried out by authorized personnel and only after the fault has been rectified.

3.2.12.2 *Pull cords* — The conveyor system shall be provided with stay-put type pull cord switches at suitable intervals along the conveyor so that any particular conveyor may be stopped from any position and in case any sequential operation is intended, the conveyor in sequence may also be stopped automatically. In case of sequential interlock system, zero speed switch and belt sway switch shall also be provided.

3.2.13 When an appliance extends out of sight of the control station operator, audible and/or visual signals shall be provided to warn personnel that the starting of the appliance is imminent.

3.2.14 All starting and stopping devices shall be clearly indicated and easily accessible. It is recommended that they be painted to a specified pattern.

3.2.15 It is recommended that all lubrication points be painted to a specified pattern.

3.2.16 Gangways, hand-rails, staircases, ladders, guards, etc shall be erected before the installation is put into service.

3.2.17 The feeding and discharge controls, either manually or mechanically operated, shall be easily accessible. They shall, where necessary be placed so as to permit supervision of the flow.

3.2.18 The openings of feeding or transfer hoppers and chutes shall be guarded if normally accessible to personnel. It is recommended that inspection doors be provided on large hoppers and chutes.

3.2.19 Counterweight tension devices shall be guarded at points normally accessible to personnel. Guards shall prevent access to the space directly below the counter-weight; in the absence of these guards, sustaining devices shall be provided, giving a clearance of at least 2.5 m above ground or other operating level.

3.2.20 All loading, unloading and transfer points shall be designed so as to prevent, as far as possible, the product or objects being conveyed from escaping, at these points or any other points along the conveyor route. Also, for personnel employed at a loading, unloading work station transfer of passage point adequate safeguards in the form of guard rails fences or close fitting guards shall be installed to prevent injury to personnel.

3.2.21 *Principles of guarding* — Guards shall be designed to prevent injury to persons and shall be provided at every dangerous part of a conveyor.

3.2.21.1 Guards shall be planned into the design of the conveyor or conveyor system and shall neither be added as an after thought nor themselves provide a hazard. Guards shall not have to be removed for normal cleaning, lubrication or belt and chain tension adjustments.

3.2.21.2 At points along a conveyor where material is likely to become dislodged and in falling become a hazard to persons, suitable guards or nonreturn flaps shall be provided.

3.3 *During the Utilization Stage (Operation and Maintenance)*

3.3.1 No continuous mechanical handling equipment shall be used for duties other than those for which it is designed nor under conditions other than those stated in the contract of the concerned parties and in the installation and maintenance booklets.

3.3.2 The user shall be careful to ensure a regular feed, avoiding over-loading. In particular, the user shall not change the feeding points, particularly not their position, or increase the flow, without previously consulting the manufacturer/constructor.

3.3.2.1 Clear operating instructions concerning the loading of the appliances shall be prominently displayed adjacent to the loading positions : they shall include the permissible unit load, its positioning and its limiting dimensions.

3.3.3 It shall be strictly forbidden to use continuous mechanical handling equipment for conveying people, unless it has been specifically designed for that purpose and meets the special requirements laid down in connection with the conveyance of people.

3.3.4 Continuous mechanical handling equipment, particularly its conveying elements, shall be kept in proper working condition as recommended by the manufacturer and shall be well maintained at all times.

3.3.4.1 All loading and working stations and the passageways shall be kept clear and clean.

3.3.5 The inspection, adjustment, maintenance and cleaning of moving parts (belts, pulleys and idlers, chains, sprockets, etc) and of cleaning devices shall be carried out regularly according to the manufacturer's instructions.

3.3.5.1 The frequency of these operations shall depend on the nature of the conveyed materials. With the exception of automatic cleaning, or in the case of special devices designed to allow cleaning while the equipment is in operation, these operations shall only be undertaken when the equipment is at rest, and after rendering the starting devices inoperative.

3.3.6 No inspection hole shall be opened while the appliance is in operation unless it complies with rule 3.1.11.

3.3.7 No one, except those so authorized, shall operate or interfere with the normal working of the plant; in particular, all starting operations shall be carried out by qualified and competent personnel only.

3.3.8 Normal and emergency stopping devices shall be made known to all personnel and be easily accessible; all areas giving access to them shall be kept clear of obstacles. Their proper working shall be periodically checked.

3.3.9 All restarting operations on an appliance which has been inoperative because of an emergency or accidental stoppage shall be preceded by an inspection aiming at:

- a) determining the cause of the emergency or accidental stoppage, and
- b) repairing the fault.

3.3.10 It shall be strictly forbidden to cross over or under an appliance except at the points specially provided for the purpose.

3.3.11 All adjustments, whether mechanical or electrical, shall be carried out by competent and authorized persons, particularly in the case of safety devices.

3.3.12 Repairs and removal of protective enclosures or panels, shall only be carried out after stopping the equipment, and after starting devices have been rendered inoperative, by a competent person appointed for that purpose.

3.3.12.1 Recommissioning shall be carried out only after the protective devices have been replaced and an order received from the authorised responsible person.

3.3.13 It shall be forbidden to carry out any lubrication while an appliance is in operation, except in cases where the parts to be lubricated are so located or there are special devices which will permit their lubrication without danger.

3.3.13.1 If, for lubrication purposes, it is necessary to remove or to open guards, lubrication shall only be carried out with the equipment rendered inoperative as stated in **3.3.12**.

3.3.14 A log-book shall be kept for each appliance and/or for each installation.

3.3.15 Suitable training (with particular reference to the operating and maintenance booklets) shall be given to a continuous mechanical handling equipment personnel, both operating and carrying out maintenance, as in the long run this may serve as the best form of accident prevention.

3.3.16 The user shall not make alternations which affect the design, construction, installation or handling requirements of the appliances without the consent of the manufacturer constructor and/or the contractor, as some alterations may give rise to detrimental consequences.

3.3.17 Inspection and adjustment of continuous mechanical handling equipment, in motion or in use, shall only be carried out with guards in position unless it is impracticable for the said operations to be carried out other than with the guards removed. If the guards are removed, such removal shall be restricted to the immediate area involved, taking all necessary precautions and especially forbidding any approach to nip points.

3.3.18 If the area where guards are removed is situated in a working area or where personnel walk, such an area shall be fenced off to prevent personnel approaching it when the appliance is in motion.

3.3.19 When guards are not in position, and the appliance is in motion, work shall only be done from a stable standing place. If a ladder is required, it shall be secured in position or firmly held by another person(s).

3.3.20 When guards have been removed from continuous mechanical handling equipment in motion, work shall only be undertaken by personnel authorized and well acquainted with the risks associated with machinery in motion. Such personnel shall wear close-fitting overall with no loose ends, preferably made in one piece.

3.3.21 If work has to be carried out on unfenced machinery in motion, another person(s), well acquainted with the actions to be taken in case of emergency shall keep watch on the person at work, and hold himself close to and ready to operate a stop device.

EXPLANATORY NOTE

IS : 7155 as code of practice for conveyor safety was published in 1974. Based on the experience gained in the field and revision of related International Standards as also the availability of some other related ISOs, this revision has been taken up.

This part 2 of the standard is one of the series of Indian Standard code of recommended practice for conveyor safety. The other parts of the standard are:

Part 1 General information, and

Part 3 Belt conveyors and feeders.

Part 1 of the standard is a necessary adjunct to other parts of this standard.

In the preparation of this standard, considerable assistance has been derived from the following publications:

ISO 1819-1977 'Continuous mechanical handling equipment — Safety code — General rules' issued by the International Organization for Standardization (ISO);

ISO 7149-1982 'Continuous handling equipment — Safety code — Special rules' issued by the International Organization for Standardization (ISO); and

AS CZ 15-1971 'SAA Conveyor safety code' issued by the Standards Association of Australia.